APSNEWS
A PUBLICATION OF THE AMERICAN PHYSICAL SOCIETY
WWW.APS.ORG/PUBLICATIONS/APSNEWS

Aug./Sept. 2012 • Vol. 21, No. 8

Focus on Advocacy
see page 6

Sam Aronson of Brookhaven Elected APS VP

APS members elected Sam Aronson of Brookhaven National Laboratory to be the next vice-president of the Society in elections that concluded on June 29. As the newest member of the presidential line, Aronson will become APS President in 2015.

The members also voted for Marcia Barbosa of the Federal University of Rio Grande do Sul, Brazil to be International Councilor, Marcelo Gleiser of Dartmouth College to be General Councilor, and Paul McEuen of Cornell as Chair-elect of the Nominating Committee.

Aronson will assume his office in January of next year, replacing Malcolm Beasley of Stanford University, who will become President-elect. This year's President-elect, Michael Turner of the Kavli Institute for Cosmological Physics at the University of Chicago, will assume the role of President, while the current President, Robert Byer of Stanford, will remain on the APS Council and Executive Board as past-President.


Sam Aronson

Aronson is currently the director of Brookhaven National Laboratory and President of Brookhaven Science Associates, the organization in charge of running the lab. He was named director in 2006, after serving as associate lab director since 2005. Aronson first came to Brookhaven in 1978 as an associate physicist, and worked his way up through the physics division to become its associate chair in 1987 and its deputy chair in 1988. In 1991 he served as senior physicist on the PHENIX detector while the RHIC particle accelerator was being built. He later returned to the leadership of the physics division and became its chairman in 2001. He was elected an APS Fellow in 2001 and a Fellow of the American Association for the Advancement of Science in 2005.

In a statement on the Brookhaven website, Aronson wrote,

"I am much honored to have been given the opportunity to lead the APS. I hope to work with the rest of the leadership team over the next few years to leverage APS'[s] considerable influence in advocating on behalf of the U.S. physics community,"

In his candidate statement, Aronson further explained his vision as part of the presidential line.

"The APS has been a strong voice in support of science literacy,

ARONSON continued on page 7

Permanent Jobs Elusive for Recent Physics PhDs

Recent physics graduates with PhDs have had a hard time finding potentially permanent jobs, and have been increasingly likely to take a post-doc position during the recession.

This is the conclusion of two studies released in July by the statistical research center at the American Institute of Physics. Taken together, the reports painted a gloomy picture of the job market for the classes of 2009 and 2010.

The studies found that fewer than 30 percent of newly minted PhDs are accepting potentially permanent positions, down from an eight-year high of 34 percent in 2008, while more than 60 percent are taking post-doc positions, up from a low in 2008 of about 55 percent.

According to this most recent survey, 13 percent took post-doc positions because they "could not obtain a suitable permanent position," up from 7 percent for the graduating classes of 2007 and 2008.

The unemployment rate for graduates with a physics PhD has hovered at around 2 percent since as far back as 1979, well below the national average, even in economic boom times. The reports, however, caution that the unemployment rate tends not to reflect the overall job market.

"Because the unemployment rate of new physics PhDs is consistently low, it is not a particularly useful indicator of job market demand," the report reads. "Instead, trends in the proportions of new PhDs accepting post-docs versus potentially permanent positions better reflect job market strength."

The majority of these potentially permanent positions were in the private sector, about 57 percent, while academic institutions

JOBS continued on page 5

APS Honors Thirty-nine Minority Scholars

The APS Committee on Minorities in physics (COM) has selected 39 students, comprised of 21 new recipients and 18 renewal students, for the 2012-2013 Scholarship for Minority Undergraduate Physics Majors.

Each new minority scholar receives $2,000, and the scholarship may be renewed once, for $3,000. The scholarship funds may be used for tuition, room and board, and educational materials. In addition, each minority scholar is paired with a mentor at his or her university, and a mentor from the APS Committee on Minorities in physics. Due to the large number of excellent applications, COM created an honorable mention category this year for students who had very good applications, but for whom funding was not available. In this first year, 16 students received honorable mentions and received a letter of recognition along with an offer of mentoring.

The scholarship, which began in 1980, is open to any African-American, Hispanic, or Native American US citizen or permanent resident who is majoring or planning to major in physics, and who is a high school senior, college freshman, or sophomore.

Since its inception, hundreds of undergraduates have received the scholarship, many of whom have gone on to receive PhDs in physics and are now working as physics faculty members in universities, as well as research scientists at corporations and national labs. Some past scholars have also become high school physics and math teachers.

Minority Scholar Carlos del-Castillo-Negrete attends Yale University. Prior to matriculating at Yale, he spent a year interning with the Spallation Neutron Source at the Oak Ridge National Laboratory. His project focused

SCHOLARS continued on page 7

New Federal Limits on Travel Could Decimate Some Meetings

Organizers of scientific meetings are concerned that new regulations issued by the Office of Management and Budget (OMB), limiting travel for federal employees, could dramatically reduce meeting attendance.

In a memo dated May 11, the OMB issued regulations aimed at cutting travel spending by 30 percent through 2016. If an agency, such as the Department of Energy, wants to spend more than $100,000 to send people to a single conference, authorization would be needed from the deputy secretary, while more than $500,000 would require the secretary of the agency to sign off. Conference organizers fear that it would be difficult to secure this authorization.

"That's a disaster for our meeting," said Cary Forest, Chair of APS's Division of Plasma Physics. "Thirty percent of our attendees are from national labs."

The DPP meeting has one of the highest proportions of federal

LIMITS continued on page 4

US Students among the Best at International Physics Competition

By Brian Jacobsmeyer

Just before the Olympic Games started in London, young teams of students from around the world converged in Estonia for the 43rd annual International Physics Olympiad. All five members of the US Physics traveling team earned at least a silver medal at the competition, and the team's combined three gold medals and two silver medals garnered a 4th place finish in the unofficial medal count. China and Taiwan tied for first place, Singapore took the next spot, and the US tied for 4th with South Korea and Russia.

Medals and honorable mentions were awarded in tiers based on a student's percentile score on theoretical and experimental exams. Students could also earn a number of special prizes for outstanding individual performances.

Almost 400 students representing over 80 countries competed between July 15th and 24th. US team member Eric Schneider's strong individual performance ranked third overall and earned him a special prize for the most creative solution to a theoretical problem.

"Without a doubt, these [problems] were harder than any theoretical questions we've had in about a decade," said head coach Paul Stanley.

The rigorous theoretical section required students to calculate how to launch projectiles onto spherical buildings, evaluate magnetic superconducting drinking straws and analyze condensation on aircraft wings in the first problem alone.

Only about 30 students earned more than 50 percent credit on this "most difficult" theoretical question, according to Stanley. Although many students struggled with this problem, Schneider followed unique paths to his solutions, achieving almost full marks that led to his special prize.

"He was able to find an elegant approach instead of brute forcing like a lot of people might have," said team coach Andrew Lin.

STUDENTS continued on page 5

Read Comics You Must


Photo by Nick Hammer

Even Jedi Masters love to read Spectra Comics, as the APS outreach team discovered at Comic-Con in San Diego in July, where they exhibited for the third year in a row. There are now four comics in the Spectra series, created by APS Head of Public Outreach Rebecca Thompson and Art Director Kerry Johnson. In addition to forming an important part of the PhysicsQuest kit that goes out annually to about 13,000 middle-school classrooms, the comics featuring laser super-hero Spectra and her friends are also distributed on a stand-alone basis, at venues such as Comic-Con. In the photo, Thompson (left) signs the latest issue as Yoda (right) looks on.

Members in the Media

"This is what physicists look like when they're excited. And also missing quite a few nights of sleep, I would imagine."

***Joe Lykken**, Fermilab, about the state of excitement at Fermilab after the last of the Tevatron data was released,* The Chicago Tribune*, July 2, 2012.*

"It looks like a Higgs; it quacks like a Higgs; but we need DNA tests (more data) to make sure it is the Higgs… For now, it is time to celebrate a little and spike the ball in the end zone."

***Michael Turner**, University of Chicago,* The Washington Post*, July 4 2012.*

"[I]n 1935, Hideki Yukawa (a Japanese theoretical physicist) predicted the existence of a particle, now called the pion, based on trying to understand nuclear reactions. The next year a particle was found in the right mass range. But further study showed that the particle that had been found did not have the right properties to be a pion, and instead was something completely unexpected, the muon."

***Paul Padley**, Rice University, on why physicists have to be careful in declaring the Higgs boson "found,"* The Houston Chronicle*, July 4, 2012.*

"The theory didn't tell us how heavy it would be, so we had to search over a large range for it… We really did design the Large Hadron Collider to be able to cover that whole range and get some kind of answer, eventually."

***William Ford**, University of Colorado Boulder, on the discovery of the Higgs Boson,* The Denver Post*, July 5, 2012.*

"It is a momentous event and I am proud to be living in these historic times. Our 40-year quest for solving a puzzle is almost ending… Now we have to find out if this new particle really is the Higgs of the Standard Model or has properties which deviate from standard expectations and if there are other new particles to be discovered."

***Meenakshi Narain**, Brown University,* LiveScience *via the* Christian Science Monitor*, July 5, 2012.*

"We, scientists, speak mathematics… This is our language–it is precise and clear, while hard to communicate to those who don't speak this language."

***Dmitri Denisov**, Fermilab,* The Wall Street Journal*, July 6, 2012.*

"Leon Lederman is a charming and amusing guy. I know him. He's always making jokes. I have no idea why that book was called The God Particle. Many physicists think it was a terrible name. I don't mind it myself."

***Robert Orr**, University of Toronto, on the origin of the term "God Particle,"* The Globe and Mail*, July 6, 2012.*

It's not at all sure yet that it is the same as the simple vanilla Higgs of the standard model of particle physics. In fact, we're all hoping that it's not. It'll be much more interesting to find something even more complicated."

***Sean Carroll**, Caltech,* Talk of the Nation*, July 6, 2012.*

"[I]t was too early in the morning for alcohol… But this was a historical moment in particle physics–the thing people have been awaiting for 30 years."

***Manfred Paulini**, Carnegie Mellon University, on why he didn't have a glass of champagne after the discovery of the Higgs,* The Pittsburg Post-Gazette*, July 10, 2012.*

"I don't think I understood at the time what a career in physics might look like. I thought I might end up being a television weatherman."

***Nigel Lockyer**, TRIUMF, on what he first thought when a professor recommended he pursue physics,* The Vancouver Sun*, July 13, 2012.*

"'Ms Milani' told me she liked older men and was tired of photo shoots… She was very convincing and I fell for the story."

***Paul Frampton**, University of North Carolina, quoted from an Argentinean newspaper on how he got lured into carrying two kilograms of cocaine onto an airplane in Argentina,* The Telegraph*, July 28, 2012.*

This Month in Physics History

August 10, 1915: Henry G.J. Moseley Killed in Action

Science students everywhere are familiar with the modern periodic table, which organizes the chemical elements based on their properties and atomic numbers. Earlier versions, however, followed a far looser organization. In 1789, for example, Antoine Lavoisier grouped his list of 33 elements into gases, metals, earths, and nonmetals. But chemists longed for a classification scheme that evinced more precision.

Dmitri Mendeleev provided a better framework in 1869 with his precursor to our modern periodic table of elements, organizing them according to the sequence of atomic masses. But there were issues with how he chose to order the elements in his table. For instance, Mendeleev assigned the atomic numbers 27 and 28, respectively, to the metals cobalt and nickel, based on their physical and chemical properties, even though cobalt had a slightly larger atomic weight and technically should have followed nickel. It was an intuitive leap: Mendeleev based his decision on the known chemical and physical properties of both elements.

Henry Moseley

There were also irregularities in the location of argon and potassium, as well as the positioning of the rare earth elements. When chemists discovered the existence of chemical isotopes, they realized that atomic weight was not the optimal criterion for ordering the periodic table. A young British physicist named Henry Moseley would provide them with a more scientifically rigorous classification scheme.

Moseley was born to privilege in 1887 in Dorset, England. His father was Henry Nottidge Moseley, a biologist and professor at the University of Oxford, and his mother was the daughter of biologist John Gwyn-Jeffreys. So the boy's early interest in zoology came naturally, as did his academic prowess. He was a stellar student at the Summer Fields School and received a scholarship to Eton. He went on to earn a bachelor's degree from Oxford's Trinity College in 1910, before joining Ernest Rutherford's laboratory at the University of Manchester. Initially he conducted physics demonstrations and worked as a teaching assistant, but soon traded in teaching to work as a research assistant.

Moseley first set about improving x-ray spectrometry, which had only recently been introduced. The spectrometer consisted of a glass vacuum tube in which electrons were fired at metallic targets, such as cobalt and nickel. Those electrons emitted photons in the x-ray regime, producing photographic spectral lines on x-ray film attached on the outside of the vacuum tube. Moseley combined this new technique with Bragg's law of diffraction to measure the various x-ray spectra associated with specific elements. In the process, he uncovered a precise mathematical relationship between well-defined lines in an element's x-ray spectrum and its atomic number. Today we know this as Moseley's law.

So the atomic numbers of the elements weren't as arbitrary as physical chemists originally thought. Moseley's work provided a firm experimental foundation for Mendeleev's earlier intuitions, resulting in more accurate positioning of the elements within the periodic table.

In fact, Moseley was able to use this mathematical relationship to correctly identify gaps in the periodic table, predicting that there should be elements with atomic numbers 43, 61, 72, and 75. All these elements were subsequently discovered: two radioactive synthetic elements–technetium and promethium, both created in nuclear reactors–and two naturally occurring elements, hafnium and rhenium. (It should be noted that Mendeleev also predicted the missing element we now know as technetium, 50 years earlier.) Moseley's work also established that there were only 15 members in the lanthanide series of rare earth elements.

In 1914, Moseley left Rutherford's Manchester laboratory, planning on returning to Oxford to pursue his physics research, but the outbreak of World War I put a wrench in those plans. Instead, he enlisted in the Royal Engineers of the British Army, serving as a technical officer of communications during the months-long Battle of Gallipoli in Turkey.

On August 10, 1915, Moseley was in the midst of sending a military order when a sniper's bullet caught him in the head and killed him. He was 27. Given all that he had accomplished at such a young age, Isaac Asimov noted that Moseley's death "might well have been the most costly single death of the War to mankind generally." Indeed, because of it, the British government established a new policy barring the country's most prominent scientists from engaging in active combat duty.

Asimov also famously speculated that, had he lived, Moseley might well have won the Nobel Prize the following year. Certainly, the trend for Nobel Prizes in physics at the time seemed to favor work related to Moseley's research. The committee chose x-ray crystal diffraction in 1914, and the first use of x-ray spectroscopy to study crystalline structure in 1915, while the 1917 prize honored work determining the telltale x-ray frequencies emitted by different elements. (There were no prizes awarded in physics or chemistry in 1916.)

Moseley's work was certainly on a comparable level, and also provided solid experimental data in support of the Rutherford model of the atom, later refined by Niels Bohr. It is easy to forget that this model–which held that the atomic nucleus contains positive nuclear charges equal to its atomic number in the periodic table–was not immediately accepted by the scientific community, "You see actually the Rutherford work was not taken seriously," Bohr observed in 1962. "We cannot understand today, but there was no mention of it any place. The great

Moseley continued on page 3

APSNEWS

Series II, Vol. 21, No. 8
August/September 2012

Coden: ANWSEN ISSN: 1058-8132

Editor . . . . . **Alan Chodos**
Staff Science Writer . . . . . **Michael Lucibella**
Art Director and Special Publications Manager. . . . . . **Kerry G. Johnson**
Design and Production. . . . . . **Nancy Bennett-Karasik**
Proofreader. . . . . . **Edward Lee**

APS News (ISSN: 1058-8132) is published 11X yearly, monthly, except the August/September issue, by the American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, (301) 209-3200. It contains news of the Society and of its Divisions, Topical Groups, Sections, and Forums; advance information on meetings of the Society; and reports to the Society by its committees and task forces, as well as opinions.

Letters to the editor are welcomed from the membership. Letters must be signed and should include an address and daytime telephone number. The APS reserves the right to select and to edit for length or clarity. All correspondence regarding *APS News* should be directed to: Editor, APS News, One Physics Ellipse, College Park, MD 20740-3844, E-mail: letters@aps.org.

Subscriptions: APS News is an on-membership publication delivered by Periodical Mail. Members residing abroad may receive airfreight delivery for a fee of $15. Nonmembers: Subscription rates are available at http://librarians.aps.org/institutional.html.

Subscription orders, renewals and address changes should be addressed as follows: For APS Members–Membership Department, American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, membership@aps.org.

For Nonmembers–Circulation and Fulfillment Division, American Institute of Physics, Suite 1NO1, 2 Huntington Quadrangle, Melville, NY 11747-4502. Allow at least 6 weeks advance notice. For address changes, please send both the old and new addresses, and, if possible, include a mailing label from a recent issue. Requests from subscribers for missing issues will be honored without charge only if received within 6 months of the issue's actual date of publication. Periodical Postage Paid at College Park, MD and at additional mailing offices. Postmaster: Send address changes to APS News, Membership Department, American Physical Society, One Physics Ellipse, College Park, MD 20740-3844.

Education Corner

A column on educational programs and publications

Now accepting applications for PAIR

Physics and Instructional Resources (PAIR) is a pilot project in physics teacher professional development designed to support physics teachers in need of content and/or material resources. This effort, funded by an APS member donation, will support up to 20 teacher + professional physicist teams to develop and implement new content-rich lessons.

A grant of up to $1,200 will be provided to each team to purchase classroom materials required for the lessons. Travel support will also be provided to the team to share their project at a regional professional meeting.

The deadline to apply is September 15, 2012. For more information, visit: www.aps.org/programs/education/highschool/teachers/pair.cfm

Gender Equity Conversations Report Published

Building on the success of the 2007 workshop, "Gender Equity: Strengthening the Physics Enterprise in Universities and National Laboratories," the Committee on the Status of Women in Physics (CSWP) began offering a new type of site visit to university physics departments and national laboratories: Conversations on Gender Equity.

With support from the National Science Foundation (NSF), CSWP conducts the Conversations on Gender Equity site visits to foster dialogue between visiting discussion leaders and the members of departments or laboratories they visit. Following the inaugural visit series, a final report was compiled showcasing the best practices for this new program. This report is freely online at: http://www.aps.org/programs/women/workshops/gender-equity/sitevisits/

New Versions of Physics InSight Available

APS has recently revamped Physics InSight–a free, downloadable Powerpoint slideshow that is designed to be shown in venues frequented by potential physics majors, such as on hallways displays in university science buildings.

One of InSight's main goals is to expose students to a range of exciting contemporary physics research areas. InSight also profiles so-called "hidden physicists," who have jobs outside of academia and who come from diverse physics degree paths—such as physics bachelors with their own startup companies, or physics masters who are now medical physicists.

Physics InSight also provides up-to-date statistical and employment information on various physics career paths, as well as information about opportunities for undergraduates–including special career-related undergraduate events at meetings, and APS Minority Scholarships.

New slideshows are generated bi-monthly, so the content is always fresh and up-to-date. Physics InSight is also fully editable, so departments can add their own slides promoting local programs.

To download the most recent version of InSight, visit www.aps.org/careers/insight

Nuggets from the education research that you can use in class tomorrow

We're getting the physics education research out of those stuffy journals and into your hands (or, rather, ears) with this little audio podcast. Co-hosted by veteran high school physics teacher Michael Fuchs and physicist and education researcher Stephanie Chasteen, each episode investigates a piece of the research literature and how it can relate to your classroom. Relevant for K12 and college instruction.

Online at the Physics Education Research User's Guide, and you can subscribe through iTunes too. http://perusersguide.org/podcasts/

This podcast is supported by a grant from the American Association of Physics Teachers (Physics Education Research Topical Group) and supported by the University of Colorado's Science Education Initiative, the Physics Education Research Group at the University of Colorado and sciencegeekgirl enterprises.

Marc Sher discusses new initiative for introductory textbooks

In Sean Carroll's Cosmic Variance blog, APS member Marc Sher explained a new initiative that hopes to provide a lower-cost alternative for introductory textbooks. Read the post here: http://tinyurl.com/7fzylbd

APS Speakers Program

The APS Speakers Lists contain names, contact information, and talk titles of physicists who are willing to give talks on a variety of subjects. A general search can be done at www.aps.org/programs/speakers/

Advanced searches allow one to search specifically for women and minority physicists and Physics Education researchers.

Moseley continued from page 2

change came from Moseley." Who knows what that talented young scientist might not have gone on to accomplish had he survived the war?

References:

Heilbron, John L. (1966) *The Work of H.G.J. Moseley*, Isis 57(3): 336-364.

Jaffe, Bernard. *Moseley and the Numbering of the Elements*. New York: Anchor Books, 1971.

Moseley, H.G.J. (1913) "The High Frequency Spectra of the Elements," M.A. *Phil. Mag*., p. 1024. [Online: http://www.chemistry.co.nz/henry_moseley_article.htm]

Website Seeks Aid for Physicist Jailed in Argentina

Several faculty members at the University of North Carolina, Chapel Hill, have banded together to help physics professor Paul Frampton, who is languishing in jail in Argentina, and whose salary has been suspended by UNC.

Spearheaded by mathematics professor Mark Williams, they have set up a website, HelpPaulFrampton.org, to raise funds for his defense, post any news, and solicit character references. Boston University professor and Nobel laureate Sheldon Glashow, with whom Frampton is co-author on 13 papers, wrote one such reference.

In January, authorities arrested Frampton in Argentina after finding two kilograms of cocaine hidden in his checked luggage. Frampton claims that he had only wanted to visit someone he thought was his internet girlfriend, and that he was the victim of a plot to traffic drugs using unwitting carriers. He has been held in the notorious Villa Devoto prison in Buenos Aires since his arrest and is facing up to 16 years in prison if found guilty of drug smuggling.

Frampton first flew to South America in expectation of meeting swimsuit model Denise Milani, a woman with whom he thought he had been having a months-long internet relationship. Instead, a man claiming to represent Milani met Frampton at his hotel and gave him a suitcase he said belonged to the model, asking Frampton to transport it to her in Brussels. After waiting a day and a half in vain for a ticket, Frampton decided to return home. He was stopped and arrested before boarding a flight to Peru when authorities found the drugs hidden in the lining of the suitcase given to him.

There is no evidence that he was ever actually in touch with Milani or that she has anything to do with the case.

Six months later, Frampton is still awaiting trial in Buenos Aires. Multiple attempts to get him released on bail have failed, and there is no word as to when his case will be brought to trial. Reportedly the judge overseeing the case is known to often deny bail.

"We just don't know when there might be the actual trial," said Williams. "We have no idea how to accelerate the process over there."

As to why he decided to travel with the unfamiliar suitcase, Frampton claims that he has emotional issues that can make him overly trusting towards others. Those who know him, including his ex-wife, have said that this is a personality trait of his.

While the case in Argentina is slowly working its way through the courts, litigation is moving forward in North Carolina between Frampton and the university over his suspended salary.

On February 17, the provost, Bruce Carney, sent a letter to Frampton informing him that because of the arrest and his inability to teach a scheduled class, the university was suspending Frampton's salary effective the 29th. Frampton asserts the class had already been canceled before he left the country because of low enrollment. In addition, his suit alleges that the university did not follow its own guidelines for levying sanctions against him, and that he was not informed of his right to a hearing before having his salary suspended.

"It appears to us the university is probably violating its own regulations in terms of how they're handling Paul's salary," Williams said, pointing to Chapter VI, section 603 of the UNC Policy Manual found on the UNC website.

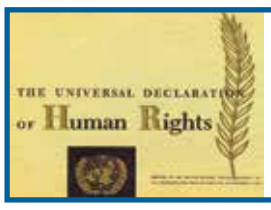
Frampton brought the suit against the university in May. A preliminary ruling in June by the Orange County Superior Court declined to reinstate his salary while the case is pending. Williams said that Frampton claims he will run out of money sometime in September if the school does not reinstate his salary.

According to court papers reported in the North Carolina regional newspaper the *News and Observer*, the university claimed to have tried to assist Frampton by locating an attorney for him, but that he would have to pay for the legal assistance. Frampton opted instead for a public defender.

UNC has declined to comment and has not issued any public statement regarding Frampton's arrest or the lawsuit because of the ongoing litigation.

The dispute has taken a personal tone. In March, Frampton was quoted in the *News and Observer* as saying "I am one of the most published physicists, and really [Carney] hasn't done much that is of interest." He and Carney both work in the school's depart-

ARGENTINA continued on page 7



APS Committee on International Freedom of Scientists

CIFS Briefs: Highlighting the Connection Between Human Rights and Science for the Physics Community

Since its creation in 1980, the APS Committee on International Freedom of Scientists (CIFS) has advocated for and defended the rights of scientists around the globe. As an APS standing committee, CIFS is charged with advising the APS leadership about "problems encountered by scientists in the pursuit of their scientific interests or in effecting satisfactory communication with other scientists." In this column, CIFS describes some of the issues that the Committee is monitoring as well as the Society's other human rights activities. Visit the CIFS website at: http://www.aps.org/about/governance/committees/cifs/index.cfm

Physicist Adlène Hicheur is sentenced to four years and then freed

On May 4, Adlène Hicheur, the CERN scientist who was detained in October 2009 and accused of association with a terror group, was sentenced in France to four years in prison for "criminal association with a view to plotting terrorist attacks." He was released from jail less than two weeks later. Prior to his conviction, CIFS had sent a letter on his behalf to the French judiciary concerning the fact that he had been detained for an extended period of time without having been formally charged with any crime.

Igor Reshetin released from Russian prison

Scientist Igor Reshetin, the former director of a rocket technology firm, who was sentenced to 11-1/2 years in prison–later reduced to seven years on appeal--in 2007 was released from prison on June 18. He was accused of selling sensitive state technology to a Chinese firm. CIFS had written to Russian authorities in 2008 on his behalf given that the charges against him appeared related to what would be considered routine scientific cooperation between research institutes in two countries.

Omid Kokabee's unfortunate prison sentence

Physics graduate student and APS member Omid Kokabee was sentenced to 10 years in prison on May 13 along with 14 other defendants in the court of Judge Salavati in Tehran. Omid was not represented by a legal counsel. His case has been advocated by many scientific and human rights organizations seeking a fair trial for him and his release from prison.

CIFS was early in writing to the Iranian authorities calling for his release from detention and permission to depart for the US to continue his graduate studies at the University of Texas at Austin (UT Austin). CIFS more recently wrote to the Iranian judiciary in June calling for a chance at a fair trial. A member of CIFS and faculty in Physics at UT Austin wrote a petition on Kokabee's behalf in the campus daily: http://www.dailytexanonline.com/firing-lines/2012/06/17/fair-trial-omid-kokabee. Several other petitions also have been initiated calling for a fair trial for Omid and his eventual release. Read more about Omid's case in the August/September 2011, October 2011 and June 2012 issues of *APS News*.

Science and Human Rights Coalition

In July, APS was represented at the biannual AAAS Science and Human Rights Coalition meeting in Washington, D.C. APS is one of more than thirty scientific organizations that is a member

CIFS continued on page 6

Letters

Readers interested in submitting a letter to APS News ***should email letters@aps.org***

Fermi and the Scientific Method

In his letter "Correcting an Omission in the Timeline of Fission" in the June *APS News*, Frank Tangherlini indicates that Fermi did not follow the scientific method.

I recommend chapter one in David Goodstein's "On Fact and Fraud" as a good explanation of how the scientific method actually works, as it might differ from the way it is taught in books. After reading that, I recommend reading the rest of the book for actual examples of the scientific method in use, or misuse.

Otherwise, I do not disagree with the timeline or its conclusions.

Glen Herrmannsfeldt
Seattle, WA

Anti-Iranian Cartoon was Ill-Advised

As we know, there is a very strong propaganda campaign in the US against the Iranian government. From the cartoon placed with a report in the June *APS News* on APS member Omid Kokabee being sentenced to ten years in Iranian prison for "cooperating with the Mossad in Israel," the Iranian judiciary is depicted as a faceless, malevolent force convicting humble chained prisoners who are guilty of simply being in the wrong place at the wrong time. Maybe that is true, but no evidence is presented in the article. Rather, it appears that the APS is joining in the propaganda campaign. Obviously, the Mossad coopts many Palestinians in the West Bank and Gaza into being spies, resulting in missiles raining down on suspected "terrorists" and anybody else who happens to be standing around. Similarly for the US drone program, supported by an extra-judicial executive kill list. At least Mr. Kokabee is given a trial. Instead of following the stereotypic US media position, the APS could have published a balanced article which contrasts the Kokabee ten year sentence with the random assassination of five nuclear engineers and scientists in Iran, evidently through the efforts of Israel/US.

Bob Harvey
Del Mar, CA

Advanced Labs Must Receive Necessary Resources

I wholeheartedly agree with Jonathan Reichert's excellent Back Page "Is There a Future for the Advanced Lab" in the June 2012 edition of *APS News*, but an important point is missing in his discussion.

The "Advanced Lab" is indeed a critical bridge between introductory demonstration experiments and working in a research laboratory. Nothing compares with the experience of watching a student suddenly understanding something they read in a textbook when they see it happen in real life, in an environment they control. I applaud Reichert's suggestions for how to maintain and strengthen this part of the physics curriculum.

Unfortunately, cost is a serious obstacle. The experiments themselves may be costly to purchase or assemble, but more important is the cost in personnel to maintain the experiments and to teach the course. It will always be necessary to have a sufficient number of competent faculty and staff dedicated to such a course, who have a presence in the laboratory and are generally accessible to the students.

Recently, there have been calls for more attention to the undergraduate STEM curriculum at major research universities. One example is the American Association of Universities (AAU) Undergraduate STEM Education Initiative <http://www.aau.edu/policy/article.aspx?id=12588>. Another is the Engage to Excel (E2E) report from the President's Council of Advisors on Science and Technology (PCAST) <http://www.whitehouse.gov/administration/eop/ostp/pcast/docsreports>. The stakeholders in these reports are prime candidates to lead the way in their own educational institutions, to reaffirm the necessity of a strong Advanced Lab component in physics curricula as well as other disciplines. Their setting the example would help aspiring institutions convince their own administrations to make this important STEM education component a priority.

Jim Napolitano
Troy, NY

Ed. Note: *Jim Napolitano has co-authored the second edition of "Experiments in Modern Physics" with Adrian Melissinos.*

Back Page Misinterprets the Data

The Back Page by Nina Byers in the July *APS News* contains a massive disconnect between the data contained in an illustration in the article and the prose describing the illustration. In the article Professor Byers states that the decrease in the total of nuclear weapons in the world in the early 1960's (principally held by the US and the then USSR) was the result of the test ban treaty. The cited figure however shows that while the US indeed decreased the weapons in its possession starting in the mid 1960's, the number of weapons in the possession of the USSR continued to increase dramatically. One could argue that the test ban treaty was but one of many factors at play affecting the numbers of US weapons. However it is indisputable that while the US reduced its nuclear arsenal from the late the 1960's through the mid 1980's the Soviet Union kept increasing its arsenal. In the words of Harold Brown, former Director of DDR&E, Secretary of the Air Force and Secretary of Defense at that time of the Cold War ..."we build they build we stop they build."

George Paulikas
Palos Verdes Estates, CA

LIMITS continued from page 1

employees and federal contractors. Forest estimated that they might be facing a deficit of 250 people at their meeting this October. He said that of the 1,700 attendees, about 500 are from national labs. Estimating that it takes $2000 to send an individual to a conference, Forest said that it likely costs the Department of Energy $1 million in travel costs, twice the amount needed to require authorization from Secretary Chu.

DPP holds APS's third largest meeting, after the March Meeting and the Division of Fluid Dynamics annual meeting. APS doesn't track how many federal employees attend each meeting, however other meetings that likely feature a large proportion of scientists from the national labs include the April Meeting, the Division of Nuclear Physics annual meeting, and the biennial meeting of the Topical Group on Shock Compression of Condensed Matter.

"Scientists at the national labs are at the top of their games," Forest said. "Their science tends to be a little different from what is done at universities."

The new limits will go into effect starting on October 1, 2012, the beginning of the 2013 fiscal year. Scientists employed by universities but receiving grants from the federal government are not subject to the new regulations.

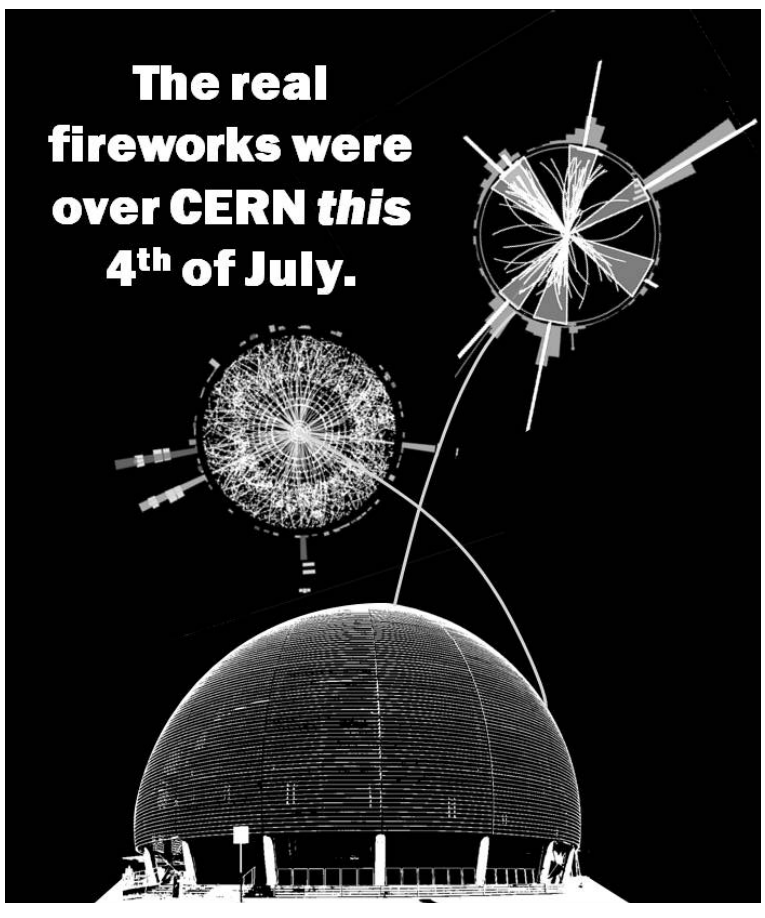
The memo was issued in response to outrage over a scandal at the General Services Administration which spent $830,000 on a conference for 300 employees in Las Vegas. Several bills have also been introduced in Congress regulating federal travel, both more and less restrictive than the circulated memo. Some of the proposed rules include limiting federal employee travel to a single conference per year, no override to spend more than $500,000 per conference and stricter reporting requirements. None of the proposed legislation has been passed as *APS News* goes to press.

"The people who screwed up weren't scientists," Forest said. He added that there have even been cities like Las Vegas that have asked APS not to come back because the physicists spent too little money in the city.

The full text of the OMB memo is available online at www.whitehouse.gov/sites/default/files/omb/memoranda/2012/m-12-12.pdf .

After Finding the Higgs Boson

Cartoon by Michael Lucibella



© 2012 Michael Lucibella Image courtesy of:CERN

Learning from Lindau: A Physics Meeting like no other

By Alaina G. Levine

In early July, more than a score of physics and chemistry Nobel Laureates and nearly 600 students from all over the world gathered in the little lake town of Lindau, Germany for the 62nd Lindau Nobel Laureate Meeting. The subject of the conference changes annually, and this year it was dedicated to physics. Over the course of a week, laureates gave formal lectures and interacted with the young researchers in intimate settings, even giving some of the students the opportunity to present their research directly to the established scientists. As many of the participants pointed out, 27 Nobel laureates aggregating at nearly one point in time and space is nothing to sneeze at. Add to this science soirée the brouhaha over that newly discovered boson, and you get a Shangri-la of physics. But don't take my word for it.

"It was unlike anything I'd ever experienced before," said Aaron Landerville, one of nearly 100 American "Young Researchers,"as they are called, to win a coveted spot to attend the Meeting. Brian Dorney, who is pursuing his doctorate at Florida Institute of Technology but has been at CERN since last October, echoed this sentiment: "The experience blew my mind," he says. "I couldn't believe I was there the whole time. It was a once in a lifetime opportunity to gain real insight into being a scientist, a researcher and doing something important."

Each of the 69 countries that sent student delegates to Lindau has their own selection process. The US program is administered by the Oak Ridge Institute for Science and Education (ORISE) for DOE and NSF, and is sponsored by the DOE Office of Science, the NSF Directorate for Mathematical and Physical Science, Oak Ridge Associated Universities (ORAU), and Mars, Incorporated. American students who are selected have their travel expenses paid for by one of these organizations, and meet in Washington, DC prior to flying to Germany for orientation and a chance to get to know one another, explains Sam Held, who oversees the US participation.

It was in DC that Landerville first recognized the significance of the program. "Instantaneously, I realized how wonderful it was to be in the delegation, with students from all over the world," he recalls. The U.S. sent the second largest number of students, just behind Germany.

Landerville is pursuing a PhD in computational modeling and shockwave physics, with an application towards materials characteristics for explosives at the University of South Florida. He found out about Lindau through his advisor, who one day informed him that he had taken the liberty of nominating him. He was funded by ORAU.

The Lindau week was jampacked with activities, including one-hour lectures by laureates in the morning, and afternoon sessions that consisted of small groups of students meeting with individual prize winners, and

LINDAU continued on page 6

Media Fellows Follow Varied Career Paths

By Michael Lucibella

For each of the last 15 years, as part of the Mass Media Fellowship program of the American Association for the Advancement of Science (AAAS), APS has sponsored one or two young scientists, with an interest in communication, to get hands-on experience at a media outlet. Participants have been placed at major newspapers, radio stations and magazines, and have then taken varied career paths, including journalism, science education and outreach, basic research and public relations. *APS News* caught up with a few of its past fellows to see what they were up to now.

David Kestenbaum was the first mass media fellow sponsored by APS. In 1997, he spent a summer at WOSU, a small NPR affiliate in Columbus Ohio. Today, he is one of the hosts of the popular NPR economics podcast *Planet Money*.

"[The AAAS fellowship] was the way I got into radio. If I didn't have that, I don't know that I would have gone into radio because I don't know how I would have gotten started," Kestenbaum said. "This was a way to get me to a radio station that was interested in having a science reporter for the summer."

Kestenbaum had already been freelancing a bit while living in Chicago when he first heard about the media fellowship. At the time he had just finished his PhD at Harvard and had been part of the Fermilab team that discovered the top quark in 1995.

"I remember reading stuff in the papers and it didn't seem like anyone really seemed to capture the fun and craziness of what actually finding the top quark was," Kestenbaum said. "I felt there was this gap."

He added that the small station was the perfect fit, because he had a lot of freedom to produce several stories that made it to air, something he likely wouldn't have had a chance to do at a bigger affiliate.

"It was this nice little universe; it was a small operation you could actually participate in. They gave you a tape recorder and like the next day you're on the radio," Kestenbaum said.

With a summer of radio reporting under his belt, he landed a six-month internship at *Science* magazine in Washington DC. However he always kept his sights on broadcasting. Science let him work four days a week so he could have one day to freelance for NPR. When the internship ended, *Science* offered him a full time job. Before he took it, Kestenbaum biked up the street to NPR's headquarters to ask the editors

MASS MEDIA continued on page 6

JOBS continued from page 1

took in about 23 percent of newly minted PhDs, and government positions (mostly in national labs) got 16 percent. For post-docs the order is flipped, with 73 percent of post-docs taking positions with academic institutions, 22 percent in the government and only 1 percent in the private sector.

About 7 percent of new PhDs took some other kind of temporary position, the majority of which, 60 percent, are as visiting professors or lecturers at colleges and universities. This number has been about the same since 1991, when the annual survey, first started asking about "other temporary" positions. All together, 82 percent of other temporary positions are in some way connected to an academic institution.

Physicists who took a post-doc position were much more likely to remain in the physics subfield of their dissertation, 72 percent as compared to 16 percent who went into another subfield of physics and 12 percent who went into another discipline all together, including engineering, business or finance, education and other sciences. On the flip side, graduates who took a potentially permanent position tended to change fields, with 42 percent going into a new discipline and 27 percent pursuing a different subfield of physics. Only 31 percent remained in the same subfield as their dissertation. Where a graduate ends up also has a big impact on remuneration. Private sector potentially permanent positions had the highest median starting salary at $90,000, while potentially permanent government workers earned a median of $85,000. Perhaps surprisingly, the starting salary for a potentially permanent spot at a university is only marginally better than for a post-doc, about $50,000 per year compared with $45,000 per year. Post-docs at government institutions took in a median starting salary of about $63,400 per year.

Because of the economic downturn, it's not that surprising to see more students go into post-doc positions," said Crystal Bailey, APS's education and careers program manager. "My guess is that students want to find permanent positions and there are lots of resources to help them do that."

APS's Physics Jobs Center, run in conjunction with Physics Today, AAPT, AAPM, IEEE Computing and SPS, has hundreds of listings for positions in both academia and industry. In addition, APS has an archive of dozens of recorded career webinars on subjects ranging from networking tips at meetings to alternative careers for physics graduates. A webinar on how to get a post-doc position is planned for early October. Both resources can be accessed through APS's Careers in Physics website at www.aps.org/careers.

The two AIP studies looked at data for more than 1,500 PhD recipients from every physics and astronomy degree granting college and university in the country. The American Institute of Physics conducts its surveys every fall to monitor the careers of physics students and graduates. The full text of these reports can be found at http://www.aip.org/statistics/catalog.html.

INSIDE THE BELTWAY

Marketing Science

by Michael S. Lubell, APS Director of Public Affairs

Science policy used to be an inside-the-beltway affair. The subject was too numbing, arcane and technical for a public that lacked the interest, education and knowledge necessary to render any meaningful judgment.

And for more than six decades, science survived and mostly thrived on the wisdom and commitment of elected officials and well-schooled policymakers. But that was during an era when public trust in government was generally much higher than it is today.

Throughout the 1960s, even with Vietnam dividing the nation, the public's trust in Washington remained above 60 percent, according to the Roper Center for Public Opinion Research. Watergate eventually took its toll, and by the time Richard Nixon resigned, it had fallen dramatically to 35 percent. But by 2012 standards, that figure would represent rapture.

Today, according to Gallup, fewer than one in five Americans has much confidence that elected officials will do the right thing in Washington. Voters delivered that message at the ballot box in 2010, when they sent a record number of members of Congress packing.

The outcome of the election also sent shockwaves throughout the political establishment. And it prompted science insiders to wonder whether the anti-establishment vote posed a danger for public support of federal research.

To shed light on the issue, the science, engineering and high-tech community engaged Public Opinion Strategies and Greenberg Quinlan Rosner in the spring of 2011 to conduct four focus groups, followed by a major national poll. The outcome was decidedly mixed.

Overwhelmingly, the respondents said they believed that it was important for the United States to be a global leader in science. But half of them gave the government a very low or failing grade for how it was managing its research programs. And they split evenly on whether cutting federal funding for science was an appropriate response.

Science, it appeared, did not draw a pass when it came to the public's general repugnance for activities that carried the imprimatur of the federal government. And with members of Congress wary of a disillusioned public that could cost them their seats, fiscal conservatives, especially, are now almost reflexively opposed to committing federal funds even to science.

Unless the mood of the country changes, it's hard to see how science will be accorded political sanctuary without greater public understanding of the societal good it delivers. And that will require scientists to become more involved with the lay public, not so much to teach science but rather to preach the value of science.

Professional societies, APS among them, devote considerable resources to outreach, education and the media. But as worthy as they are, at least among adults, these efforts are most likely to reach an audience already attracted to science. Only rarely do they connect with people for whom science is a disconnect.

If average American citizens know little of the benefits they have derived from science–apart from medicine–it is the fault of the science community for not expending more effort to provide the narrative. That must change.

In arguing that physicists have been ducking a social responsibility, I am not suggesting we suffer from lassitude in any way. Far from it: almost all of us are overburdened with the demands of our profession. But if we ensconce ourselves in our laboratories and talk only to each other when we venture out, we cannot expect the public to grasp the societal value of science from a few snippets of news they might accidentally encounter.

And if the public doesn't appreciate the value of science and doesn't trust its elected representatives to make wise choices, science will suffer and with it the notion of exceptionalism to which most Americans pay homage.

Science has been the principal driver of our nation's economy for six decades. It has protected us from our adversaries and provided medicine with the diagnostic tools and cures we all prize.

MARKETING continued on page 7

STUDENTS continued from page 1

Stanley and Lin agreed that the experimental section was comparable in difficulty to previous years. The experimental half of the exam included a circuit problem and an investigation of the magnetic permeability of water. Event organizers even developed custom multimeters for the experimental section with simultaneous voltage and current measurements and data logging capabilities.

Students didn't travel to Estonia solely for their exams, however. For the rest of the trip, the teams mingled while exploring cultural and tourist sites throughout the country. Outside of the classroom, the students visited coastal islands, a meteor impact crater, surviving medieval towns, and an outdoor adventure park.

The sporting mood of the London Olympics even drifted east toward Estonia, and the students competed in a friendly international soccer tournament. Students on the team truly enjoyed the opportunity to speak with their international peers in a relaxed setting, according to Stanley.

Lin experienced similar opportunities as an alumnus of the 1998 and 1999 US Physics Teams. After traveling as a coach with the team this year, Lin now has a more nuanced perspective on the competition.

"It was really interesting to see how it has grown and also to see it from the leader's point of view," said Lin.

Over the years, competition has stiffened as more teams have joined, but the US has consistently performed at a high level. During his roughly ten year tenure as academic director, Stanley estimated that the highest team performance was third place, so this year ranks among the best US results since the team first participated in 1986.

The American Association of Physics Teachers and the University of Maryland are responsible for recruiting and training the US team every year with financial support from over a dozen organizations, including the APS.

Photo by Paul Stanley

Every member of the U.S. Physics Team earned either a silver or gold medal at this year's Olympiad, and the team placed 4th in the overall medal count. Pictured from left to right are traveling team members Jeffrey Cai (silver medalist), Jeffrey Yan (silver medalist), Allan Sadun (gold medalist), Kevin Zhou (gold medalist) and Eric Schneider (gold medalist).

APS Honors Two Colorado Sites

In July, APS President Robert Byer presented a pair of plaques to two institutions in Colorado, each of which was celebrating its 50th anniversary. The plaques designated these institutions as physics historic sites, as part of the APS Historic Sites Initiative. The top photo, taken on July 7, shows Board Chair Michael Turner unveiling the plaque presented to the Aspen Center for Physics, as Aspen Center President Rosemary Wyse (left) and Byer (right) look on. Turner is also currently President-elect of APS.

The lower photo was taken six days later in Boulder, at the plaque presentation to JILA, a joint institute of the University of Colorado Boulder and the National Institute of Standards and Technology. Eric Cornell, JILA Chair, dramatically unveils the plaque while Byer (left) watches, and the crowd (not shown) goes wild. Top Photo by Grundy Jonsson Photographers. Bottom Photo by Brad Baxley/JILA.

MASS MEDIA continued from page 5

there for a job. Again he worked out a way to split his time between the two organizations, four days a week at the magazine and one at NPR. In 1999 NPR hired him full time as a science reporter.

At NPR he covered science for ten years, reporting on new discoveries and the politics of science, as well as some of the "dark sides" of science, including the Northeast blackout, the failed New Orleans levees and the Gulf oil spill.

In 2008, after the global financial crisis and ensuing recession, fellow reporter Adam Davidson asked Kestenbaum to join *Planet Money*, NPR's new venture to report on the economy. Though he had little background in economics, the subject's quantitative nature appealed to Kestenbaum, and he's been on the beat ever since.

"I often think that business is like engineering and economics is sort of like physics," Kestenbaum said. "It's the sort of underlying rules, or what we think might be the rules."

Stephanie Chasteen had experience behind a desk at NPR during her summer as an APS fellow in 2003. Today she runs a science outreach business called "Science Geek Girl" that helps educators and researchers develop new curricula for college and high school students.

"I do a variety of education consulting," Chasteen said. "I call myself a consultant who provides support for educational reform."

She is also working to help professors and future teachers develop new educational material at the University of Colorado, Boulder. There, she helps instructors and education undergraduates find new ways to connect students with science. Her official title is the "Outreach Coordinator," which brings with it a range of responsibilities. She's written articles about education, hosted workshops on the subject and consulted with teachers. Podcasts are her specialty, giving her a chance to draw on some of the audio production skills she learned at NPR.

"It's turned out that I've used the writing in general and the audio experience in particular in a lot of different ways," Chasteen said. "I would say that my niche is I write about education… It's just a different kind of science"

At NPR's science desk, she helped cover stories, and developed a few stories of her own for the radio. She reported on the first cloned horse, and the discovery of a new dinosaur fossil in India. David Kestenbaum even helped her with voice coaching lessons on occasion.

"I feel that that NPR experience showed that I was really capable," Chasteen said. "Once I got that on my resume with NPR, people really started to notice me."

After her summer internship, she received an NSF grant for a post-doc position at the Exploratorium in San Francisco. There her focus shifted from reporting science news to improving science education in the classroom. Working with teachers, running workshops and teaching inquiry methods of education replaced tracking down sources and hunting for stories.

"I felt that I could make a bigger impact through the education," Chasteen said. "I'm sort of one small drip in one large pool of science literacy."

In 2008 APS sponsored Carrie Nugent, a recent graduate from UCLA, to work at *The Oregonian* newspaper for the summer. She was excited to go. Writing for a science desk was something she had wanted to try for a long time.

"It just sounded awesome," Nugent said. "I always thought that being a reporter would be a super cool thing."

While at the paper, Nugent wrote articles about dogs helping to save a rare species of butterfly by sniffing out lupine blossoms, the environmental effects of a common cleaning agent, and home experiments for the microwave oven. Her favorite was about an entomologist whose job was to identify insects that people mailed to him. Every day some new arthropod would show up in his mailbox from some far off part of the state.

"It was really funny, it was really strange and I really enjoyed talking with him," Nugent said.

Today she's working on finishing up her PhD thesis on asteroids at UCLA. She has her eye on a couple of post-doc positions, especially one at NASA's Jet Propulsion Laboratory. In 2011, Nugent developed a ten-week astronomy seminar for undergraduates in the school's education program, centered on the premise of Earth not having a moon. She also works for the American Astronomical Society's division of planetary sciences subcommittee on federal relations advocating for more NASA funding. She says she frequently draws on her experience at the *Oregonian*.

"I think it's been extremely helpful," Nugent said. The congressional briefings she helps prepare for lawmakers "have to be clear and accessible and short," a skill she picked up at the paper.

CIFS continued from page 3

of the Coalition, which facilitates communication and cooperation within the scientific community on the topic of human rights. Coalition members recognize that there is a connection between science and human rights and that scientists have an important role to play in the realization of human rights.

In particular, APS was pleased to participate in the Welfare of Scientists Working Group meeting. This Working Group seeks to increase the effectiveness of scientific organizations in defending the human rights of scientists. Coalition members learned about the actions that other scientific organizations have taken on behalf of scientists around the world whose rights have been violated. Learn more about the Coalition at: http://shr.aaas.org/coalition/index.shtml

Please follow new developments and reports of activities on the CIFS website: http://www.aps.org/about/governance/committees/cifs/index.cfm

Focus on Advocacy

Kevin T. Pitts

Kevin T. Pitts is the associate head of undergraduate programs and a professor at the University of Illinois. He is an experimentalist currently active on the Collider Detector and muon g-2 experiments at Fermilab. Pitts became interested in advocacy during the 2007-2008 fiscal year when, as chair of the Fermilab executive user's committee, federal funding for high energy physics was significantly cut. During that time, Pitts worked with the APS DC office and authored a popular piece in the *Chicago Tribune*, led letter writing drives and participated in congressional visits. Currently, Pitts maintains a general physics outreach blog, which discusses policy among other topics. He recently published an op-ed in the *Champaign Urbana News-Gazette* discussing the need for a congressional "champion of science." (http://physics.illinois.edu/undergrad/post-details.asp?1748) While not all op-eds reach lawmakers ears, Pitts said "I was encouraged to hear a response from my senator's office" regarding his call for science champions.

LINDAU continued from page 4

"Master Classes," in which some pupils gave ten minute research talks to the laureates for feedback. There were also mandatory breakfasts, lunches and evening affairs, which usually consisted of various cultural opportunities that encouraged students and laureates to get to know each other.

The Nobel prize winners were very approachable, notes Dorney, especially Brian Schmidt, the youngest and newest laureate in attendance. In fact, one evening, while Dorney was having dinner with other students, Schmidt "came out of nowhere and sat down and spent the next 3-4 hours talking with us." He gave the emerging scholars advice about pursuing what they love. During an afternoon chatfest, "Schmidt said 'we don't do physics to win a Nobel Prize, we do it because it's interesting.' He truly believes he was doing what he was doing because it made him happy," recounts Dorney. "On my own, I have struggled because …I thought my research was not very novel. But going to Lindau inspired me that no matter what happens, I am going to be ok and it won't be the end of the world if I have to switch fields." And regarding Schmidt's advice, "I may never see him again but for that week he was like a mentor," he says.

This year's conference was punctuated by the Higgs Boson announcement. The Lindau leaders arranged for the CERN press conference to be broadcast live during the conference, and then later in the day organized a special panel discussion with several Laureates and a live feed with LHC scientists to discuss the significance of the discovery. The panel consisted of David Gross, George Smoot, Carlo Rubbia and Martinus "Tini" Veltman, all of whom trumpeted the discovery as a triumph for physics, theory, and humanity. Dorney recalls a specific message from the panel: "there is much more to do, there are more Nobel Prizes to be won."

Lindau's leitmotif of "Educate. Inspire. Connect." was certainly amplified by the students who attended, who praised the experience as life-changing. "It made me question my career goals tremendously–whether I want to stay in academia or do something to affect policy and attitudes in science," said Landerville. "I am more open…that there might be connections between my field and others…It revitalized my interest to get out on my own from grad school and explore these possibilities."

As for the laureates themselves, many of whom have participated in the conference more than once, they enjoyed the opportunity to meet and speak with students from all over the world. "That's the best part of being in Lindau," said Bill Phillips. "That's the reason to come here. I don't come here to meet the other Laureates." He noted that he finds inspiration from the students, perhaps as much as they do from him. "One of the things I learn here is how little I understand, and how much I need to deepen my knowledge, about certain things."

But the fact that his Prize-winning peers are also present does make a positive impression. "I have had [the] experience a few times, of meeting physicists who were already legendary long before I started studying physics, and that's really quite remarkable to meet these people who I viewed as legends of the past," described Phillips, with a chuckle. "One of the things that was really remarkable about Lindau the first time I went was I met Mössbauer. Now, I thought Mössbauer was dead."

Alaina G. Levine is a science writer and President of Quantum Success Solutions, a science career and professional development consulting enterprise. She attended Lindau on a travel fellowship from the Council for the Lindau Nobel Laureate Meetings, administered by the National Association of Science Writers. She can be contacted through www.alainalevine.com.

ANNOUNCEMENTS

ARGENTINA continued from page 3

ment of physics and astronomy.

"He is an esteemed teacher and accomplished researcher, having published over 300 scholarly papers and several advanced scientific books," Glashow wrote in his reference for Frampton. "I cannot imagine that Paul was aware of the illegal drugs that were secreted within his checked luggage. Professor Paul Frampton is an internationally known scholar; he is honest, but he is also naive."

Eight other professors, including former APS President Eugen Merzbacher, have also written letters on Frampton's behalf.

While in jail, Frampton has continued to advise his two graduate students through sporadic phone calls. He has authored two scientific papers with the help of the prison's collaboration with the University of Buenos Aires.

The website organizers also sent a letter signed by 26 professors to the whole faculty of UNC on August 1, alerting the school to Frampton's predicament and lawsuit. Within a day of the letter being sent out, more than two dozen people added their names to the letter in support. Several of the founders of the website have also written to the Argentinean judiciary in an attempt to expedite the case. However it is an uphill legal fight for Frampton.

"There is almost no record of success in cases like this," Williams said. "It's a tough thing to argue because everyone in this situation claims that they were set up," He added that Frampton's computer records of emails and chats with the person claiming to be Milani should show that he honestly thought he would be meeting the model at the airport.

In June, David Schwartz, an employee of UNC, attempted to visit Frampton at the prison. He was prevented from meeting Frampton face to face, but Schwartz's brother in law, who is a lawyer in Argentina, was able to pass a message to him.

"He wanted me to know that he was ok and appreciated that I had come," Schwartz said. Also in the letter, Frampton said that he was happy to be able to read physics papers again, but the prison stay had been taking its toll on his health. Schwartz added that even Frampton's public defender in Argentina agreed it was a difficult case.

"It's one thing if it's some naive kid from the provinces saying 'I was set up,'" Schwartz said. "It's harder to convince a judge or jury that someone who is well respected for his intelligence can be entrapped in this way."

ARONSON continued from page 1

the excitement and importance of scientific discovery and science-based policy making," Aronson wrote. "I believe this advocacy is among the most important tasks of the APS and I would like to work to extend and expand the APS' reach outside the scientific community to communicate this to the next generation of physical scientists, policy makers and informed citizens."

Marcia Barbosa is a statistical physicist at the Federal University of Rio Grande do Sul, Brazil where she studies the thermodynamic behavior of complex fluids. She is currently the director of the physics institute at her university. In addition she is also currently the chair of the physics committee at the Brazilian funding agency, the National Council for Scientific and Technological Development, and a member of the National Council of Science and Technology which is chaired by Brazil's president.

"Physics is on the edge of new discoveries in many sub fields from high energies to astrophysics and nanoscience. However, this very interesting moment coincides with economic difficulties that affect not only the everyday life of the universities and the research centers but the large programs that are fundamental in these new discoveries," Barbosa said. "The community has to be prepared to show to the society that physics and in particular basic physics is very important not only for restoring the economic growth but also for doing that in a more sustainable and socially fair way."

She added that as International Councilor she hopes to strengthen ties with societies in other parts of the world. "Establishing programs and exchange of experiences between the physical societies of these countries and APS would be beneficial for both. In particular I hope to be able to serve as a link for the science with no borders, a new program that send students from Brazil to other countries."

Marcelo Gleiser is a theoretical physicist at Dartmouth College who studies the many intersections of field theory, relativity and cosmology. He has been at Dartmouth since 1991 and received the Presidential Faculty Fellows Award from Bill Clinton in 1994. He has served on several of NSF and NASA advisory panels. In addition, he has worked to promote science to the public by giving public lectures, appearing on television, writing three popular books about particle physics and helping to start NPR's science and culture blog "13.7."

Paul McEuen is a physicist at Cornell where his work focuses on the electronic, mechanical and optical properties of nanostructures and their applications. He served on the APS Division of Condensed Matter Physics Executive Committee from 2003 through 2006. In addition he has been on numerous government advisory committees, including the Department of Energy's Basic Energy Sciences Advisory Committee, Grand Challenges in Energy Subcommittee and the National Research Council's Decadal Survey Team on Condensed Matter and Materials Physics.

"We must more effectively communicate the content and value of our research to the public and to policymakers," McEuen said. "This is especially important in these times of extreme budgetary and societal pressures. Simultaneously, we must resist the continual bureaucratic creep from universities and funding agencies that slows down research and makes us less effective."

MARKETING continued from page 5

It is now time for us to broadcast the science story more widely. As odious as it may sound to a community that probably doesn't watch the TV hit show "Mad Men," we must begin to market and advertise science as a social good to a vast public that has likely never thought about it. It is time for us to expand the public outreach toolkit.

In an era when public trust in government is at a historic low, we must move science advocacy beyond the beltway. We must become as adept with public engagement as we are with research and discovery. We owe it to ourselves and to our nation. We must begin a science marketing campaign now. Science matters.

SCHOLARS continued from page 1

on tackling the problem of how to reduce beam loss in high power particle accelerators. He noted that although this research was, at times, frustrating and unsuccessful, the process of discovery that followed was rewarding and fulfilling.

Michael Karl Medina also attends Yale and is taking a full load of physics courses for the upcoming year including quantum mechanics, introduction to nuclear and particle physics, and statistical thermodynamics, along with continued lab experimentation in preparation for a senior research project. Last summer, he interned at NASA's Langley Research Center where he produced a versatile computer program in Mathematica outputting a highly random pattern of elliptical markers used in optical techniques. This past summer, he participated in the Science Undergraduate Laboratory Internships program at Argonne National Laboratory. He worked with the Medium Energy Physics group involved in several measurements aimed at understanding the quark substructure matter.

Scholar Natalia Guerrero is a physics major at the Massachusetts Institute of Technology. She entered MIT interested in astrophysics broadly but has since started to focus on dark matter. This past summer, she conducted research at the MIT Laboratory for Nuclear Science on the MiniCLEAN (Mini Cryogenic Low Energy Astrophysics with Noble liquids) experiment with the neutrino and dark matter physics group. Her group at MIT works on eliminating neutron backgrounds with shielding, calibration, and neutron I.D. algorithms. Natalia's research focus, however, was on the neutron calibration system for the MiniCLEAN experiment.

A standout writer, Haris Durrani studies applied physics at Columbia University where he is an Egleston Scholar. This past summer, he held down two jobs. First, he was a research intern at Columbia's Robotics Lab on a Brain Computer Interface wheelchair/mobile-manipulator and robotic arm project. His second job was at Scholastic, for The Alliance for Young Artists & Writers as the Editor for the annual anthology, *The Best Teen Writing of 2012*, which will be published this fall and available on Amazon. Haris has also been published in the 2010 and 2011 editions of *The Best Teen Writing* and was interviewed thrice on John Hockenberry's NPR show, The Takeaway, which is about writing, multiculturalism, and youth issues. His engineering-focused novelettes, "The Photosynthesis of Living Engines" and "Tethered," were semifinalists at the L. Ron Hubbard Writers of the Future Contest, one of the most esteemed competitions for budding talent in the field of science fiction.

More information about the scholarship and the names of all the recipients can be found at http://www.aps.org/programs/minorities/honors/scholarship/

The Back Page

Has the Battery Bubble Burst?

by Fred Schlachter

Three years ago at a symposium on lithium-air batteries at IBM Almaden there was great optimism. The symposium "Scalable Energy Storage: Beyond Lithium Ion" had as a working message: "There are no fundamental scientific obstacles to creating batteries with ten times the energy content–for a given weight–of the best current batteries."

Optimism had all but vanished this year at the fifth conference in the scalable-energy-storage series in Berkeley, California. The symposium announcement reads: "Although new electric vehicles with advanced lithium ion batteries are being introduced, further breakthroughs in scalable energy storage, beyond current state-of-the-art lithium ion batteries, are necessary before the full benefits of vehicle electrification can be realized." The mood was cautious, as it is clear that lithium-ion batteries are maturing slowly, and that their limited energy density and high cost will preclude producing all-electric cars to replace the primary American family car in the foreseeable future. "The future is cloudy" is how Venkat Srinivasan, who heads the battery research program at Berkeley Lab, summarized the conference.

Electric cars have a long history. They were popular at the dawn of the automobile age, with 28 percent of the automobiles produced in the United States in 1900 powered by electricity. The early popularity of electric cars faded, however, as Henry Ford introduced mass-produced cars powered with internal-combustion engines in 1908.

Gasoline was quickly recognized as nature's ideal fuel for cars: it has a very high energy density by both weight and volume–around 500 times that of a lead-acid battery–and it was plentiful, inexpensive, and seemingly unlimited in supply. By the 1920s electric cars were no longer commercially viable and disappeared from the scene. They did not reappear until late in the 20th century as gasoline became expensive, supplies no longer seemed unlimited, and concerns over the possible effect of combustion of fossil fuels on global climate reached public awareness.

Electric cars are returning with the advent of battery chemistries that are more efficient than the lead-acid batteries of old. A new generation of electric cars has come in the form of hybrid electric vehicles (HEVs), plug-in hybrid vehicles (PHEVs), and fully electric or battery electric vehicles (BEVs). Most of the latest generation of electric vehicles are powered by lithium-ion batteries, using technology pioneered for laptop computers and mobile phones.

Powering cars with electricity rather than with gasoline offers the dual advantages of eventually eliminating our dependence on imported fossil fuels and operating cars with renewable energy resources. Eliminating dependence on petroleum imported from often-unfriendly countries will greatly improve our energy security, while powering cars from a green grid with solar and wind resources will significantly reduce the amount of CO_2 released into the atmosphere.

The major barrier to replacing the primary American family car with electric vehicles is battery performance. The most significant issue is energy storage density by both weight and volume. Present technology requires an electric car to have a large and heavy battery, while providing less range than a car powered by gasoline.

Batteries are expensive, resulting in electric cars typically being much more expensive than similar-sized cars powered by gasoline. There is a sensible cost limit when the cost of an electric car and electricity consumed over the life of the car considerably exceeds the cost of a car with an internal combustion engine including gasoline over the life of the car.

Safety is an issue much discussed in the press. Although there are more than 200,000 fires per year in gasoline-fueled cars in America, there is widespread fear of electricity. Batteries in cars powered by electricity will surely burn in some accident scenarios; the fire risk will probably be similar to gasoline-powered cars.

Stored energy in fuel is considerable: gasoline is the champion at 47.5 MJ/kg and 34.6 MJ/liter; the gasoline in a fully fueled car has the same energy content as a thousand sticks of dynamite. A lithium-ion battery pack has about 0.3 MJ/kg and about 0.4 MJ/liter (Chevy VOLT). Gasoline thus has about 100 times the energy density of a lithium-ion battery. This difference in energy density is partially mitigated by the very high efficiency of an electric motor in converting energy stored in the battery to making the car move: it is typically 60-80 percent efficient. The efficiency of an internal combustion engine in converting the energy stored in gasoline to making the car move is typically 15 percent

Photo by Roy Kalschmidt/Berkeley Lab

The 2013 Ford Energi plug-in hybrid, with the Golden Gate Bridge visible in the background.

(EPA 2012). With the ratio about 5, a battery with an energy storage density 1/5 of that of gasoline would have the same range as a gasoline-powered car. We are not even close to this at present.

Powering a car with electricity is considerably more efficient than powering a car with gasoline in terms of primary-energy consumption. While the efficiency of energy use of an electric car is very high, most power plants producing electricity are only about 30 percent efficient in converting primary energy to electricity delivered to the user. Conversion of petroleum to gasoline is highly efficient. This results in electricity having a factor of 1.6 improvement in use of primary energy relative to gasoline, and is an important point in its favor.

A 2008 APS report on energy efficiency examined statistics on how many miles Americans drive per day. The conclusion of that study was that a full fleet of PHEVs with a 40-mile (60-km) electric range could reduce gasoline consumption by more than 60 percent. Thus America may not need a full fleet of BEVs to achieve a very considerable reduction in gasoline use.

The compelling question is whether electric cars can provide the convenience, cost, and range necessary to replace their gasoline-powered counterparts as the primary standard American family car. And this hinges almost entirely on the state of battery development, coupled with issues of making the grid green and providing widespread infrastructure for recharging electric vehicles.

The answer today is mixed:

- HEVs are already popular, even though they represent only a small fraction of cars on the road today. The present generation of batteries is adequate for HEVs, and range is not an issue, as 100 percent of the energy to power the car comes from gasoline. Purchase cost is higher than for a conventional car; the advantage is a 40 percent or more improvement in fuel economy (EPA 2012).
- PHEVs are now coming onto the market (Fig. 1). Electric range is limited, and batteries presently available are only marginally adequate. Total range is not an issue as gasoline is stored onboard as a "range extender."
- BEVs coming onto the market are expensive and the range is too small for many American drivers, at least as the primary family vehicle. Batteries with a much higher energy storage density and a lower cost are needed for BEVs to become popular outside a limited market of upscale urban dwellers as a second car to be used for local transportation, where home recharging is feasible, and where charging time is not an issue.

Battery requirements are different for HEVs, PHEVs, and BEVs. A battery for an HEV does not need to store much energy, but needs to be able to store energy quickly from regenerative braking. Because it operates over a limited charge/discharge range, its lifetime can be very long. A PHEV battery must have much greater energy-storage capacity to achieve a reasonable electric range and will operate with a considerably greater charge/discharge range, which limits the cycle life of the battery. The battery for a BEV must supply all the energy to power the car over its full range–say 150-300 km–and must use most of its charge/discharge range. These requirements mean the battery for a BEV will be large, heavy, expensive, and have a limited cycle life. Replacing a battery for a BEV could entail a cost exceeding ten thousand dollars, which, divided by miles driven, will likely exceed by a large amount the cost of electricity to power the car.

The Berkeley 2012 symposium focused on two alternative chemistries: lithium/oxygen (lithium/air) and lithium/sulfur. Both theoretically offer much higher energy density than is possible even at the theoretical limit of lithium-ion-battery development. However, the technical difficulties in making a practical battery with good recharging capability using either of these chemistries are considerable.

There are major research issues concerning all aspects of a battery: the cathode, the anode, and the electrolyte, as well as materials interfaces and potential manufacturing issues. A Li/air (Li/O_2) battery requires cooled compressed air without water vapor or CO_2, which would greatly complicate a Li/air battery system. A Li/air battery would be both larger and heavier than a Li-ion battery, making prospects for automobile use unlikely in the near term. However, a leading battery-development group at IBM wrote in a 2010 article on lithium-air batteries; "Automotive propulsion batteries are just beginning the transition from nickel metal hydride to Li-ion batteries, after nearly 35 years of research and development on the latter. The transition to Li-air batteries (if successful) should be viewed in terms of a similar development cycle." Perhaps we need to be patient.

Many approaches are being followed to develop and improve battery performance, including studies using nanotubes, nanowires, nanospheres, and other nanomaterials. However, none of the researchers reported progress to the point where a practical battery using Li/air or Li/S could be envisioned

Thomas Greszler, manager of the cell design group at General Motors Electrochemical Energy Research Lab, was pessimistic about the prospects for new battery chemistries: "We are not investing in lithium-air and lithium-sulfur battery technology because we do not think from an automotive standpoint that it provides a substantial benefit for the foreseeable future."

A significant infrastructure challenge is the network that will need to be constructed for recharging the battery of a BEV. There are more than 120,000 gasoline filling stations in the United States. With the range of a present-day BEV being less than a third of that of a gasoline-powered car, a very large number of recharging stations will be required, in addition to home charging, which may be feasible only for those who live in private homes or apartment buildings with dedicated parking.

Charging an electric car takes hours, and even a fast charge will take longer than most people will be willing to wait. And charging should be done at night, when electricity generation and grid capacity are most available

Battery research is being funded at a modest level, as there is a false perception among the public and policymakers that present battery performance is adequate for widespread acceptance of battery-electric vehicles. The national focus has been on renewable sources of energy. The United States will not become independent of foreign oil and combustion of fossil fuels until new battery technologies are developed. This will require a concerted national effort in science and technology at a considerable cost.

Fred Schlachter recently retired as a physicist at the Advanced Light Source, Lawrence Berkeley National Laboratory. He is co-author of the 2008 APS report Energy Future: Think Efficiency*, for which he wrote the chapter on transportation.*

"Moore's Law" for Batteries?

Isn't there some kind of "Moore's Law" for batteries? Why is progress on improving battery capacity so slow compared to increases in computer-processing capacity? The essential answer is that electrons do not take up space in a processor, so their size does not limit processing capacity; limits are given by lithographic constraints. Ions in a battery, however, do take up space, and potentials are dictated by the thermodynamics of the relevant chemical reactions, so there only can be significant improvements in battery capacity by changing to a different chemistry.